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FRIDAY, APRIL 26, 1895.

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MSS. intended for publication and books, etc., intended for review should be sent to the responsible editor, Prof. J. McKeen Cattell, Garrison on Hudson, N. Y.

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NATIONAL ACADEMY OF SCIENCES.

THE *National Academy of Sciences* met at Washington on April 16, 17, 18 and 19, Professor O. C. Marsh, president, in the chair. The following members were reported as present:

Professor C. Abbe, Gen. Henry L. Abbot, U. S. A., Professor Alexander Agassiz, Professor George F. Barker, Professor Carl Barus, Dr. John S. Billings, Professor H. P. Bowditch, Mr. Lewis Boss, Professor W. K. Brooks, General Thomas L. Casey, U. S. A., Professor Charles F. Chandler, Professor S. C. Chandler, General Cyrus B. Comstock, Professor E. D. Cope, Professor Russel H. Chittenden, Professor Theodore N. Gill, Professor Wolcott Gibbs, Mr. G. K. Gilbert, Professor G. Brown Goode, Professor Benjamin A. Gould, Professor Arnold Hague, Professor Asaph Hall, Professor Charles S. Hastings, Mr. George W. Hill, Professor O. C. Marsh, Professor T. C. Mendenhall, Dr. S. Weir Mitchell, Professor A. A. Michelson, Mr. Edward S. Morse, Professor Simon Newcomb, U. S. N., Professor Ira Remsen, Professor Henry A. Rowland, Professor Charles A. Schott, Professor John Trowbridge, General Francis A. Walker, Professor Charles A. White.

The papers entered to be read were as follows:

1. *On Some Variations in the Genus Encope:* A. AGASSIZ and W. MCM. WOODWORTH.
2. *Notes on the Florida Reef:* A. AGASSIZ.
3. *The Progress of the Publications on the Expedition of 1891 of the U. S. Fish Commission Steamer 'Albatross,' Lieut. Commander Z. L. Tanner, commanding:* A. AGASSIZ.
4. *On Soil Bacteria:* M. P. RAVENEL. (Introduced by J. S. BILLINGS.)

5. *A. Linkage Showing the Laws of the Refraction of Light:* A. M. Mayer.
6. *On the Color Relations of the Atoms, Ions and Molecules:* M. Carey Lea.
7. *Mechanical Interpretations of the Variations of Latitude:* R. S. Woodward. (Introduced by S. C. Chandler.)
8. *On a New Determination of the Nutation-Constant, and some allied topics:* S. C. Chandler.
9. *On the Secular Motion of a Free Magnetic Needle:* L. A. Bauer. (Introduced by C. Abbe.)
10. *On the Composition of Expired Air, and Its Effect Upon Animal Life:* J. S. Billings.
11. *Systematic Catalogue of European Fishes:* Th. Gill.
12. *The Extinct Cetacea of North America:* E. D. Cope.
13. *On the Application of a Percentage Method in the Study of the Distribution of Oceanic Fishes.*
    A. Definition of Eleven Faunas and Two Sub-faunas of Deep Sea Fishes.
    B. The Relationships and Origin of the Carribeo-Mexican and Mediterranean Sub-faunas: G. Brown Goode.
14. *On the Two Isomeric Chlorides of Ortho-sulpho-benzoic Acid:* Ira Remsen.
15. *On Some Compounds Containing two Halogen Atoms in Combination with Nitrogen:* Ira Remsen.
16. *Presentation of the Watson Medal to Mr. Seth C. Chandler, for his Researches on the Variation of Latitudes, on Variable Stars, and for his other works in Astronomy.*
17. *Biographical Memoir of Dr. Lewis M. Rutherfurd:* B. A. Gould.
18. *Relation of Jupiter's Orbit to the Mean Plane of Four Hundred and One Minor Planet Orbits:* H. A. Newton.
19. *Orbit of Miss Mitchell's Comet, 1847, VI:* H. A. Newton.

The officers elected were as follows: President, Prof. Wolcott Gibbs; Vice-president, Gen. F. A. Walker; Home Secretary, Prof. Asaph Hall; Foreign Secretary, Prof. A. Agassiz; Treasurer, Dr. John S. Billings; additional members of the Council, Prof. George J. Brush, Prof. George L. Goodale, Dr. B. A. Gould, Prof. O. C. Marsh, Prof. Simon Newcomb and Prof. Ira Remsen.

The new members elected were Prof. W. L. Elkin, professor of astronomy in Yale Observatory; Prof. C. S. Sargent, professor of botany in Harvard University; Dr. W. H. Welch, professor of pathology in Johns Hopkins University, and Prof. C. O. Whitman, professor of biology in the University of Chicago. The foreign associates elected were Prof. Rudolph Leuckart, professor of zoölogy in the University of Leipsic; Prof. Julius von Sachs, professor of botany in the University of Würtzburg, and Prof. Sophus Lie, professor of mathematics in the University of Leipsic.

The Barnard Medal was awarded to Lord Rayleigh for his discovery of argon, and the Watson Medal to Professor S. C. Chandler for his researches on the variation of latitude and other subjects.

The autumn meeting of the Academy will be held at Philadelphia, beginning October 29.

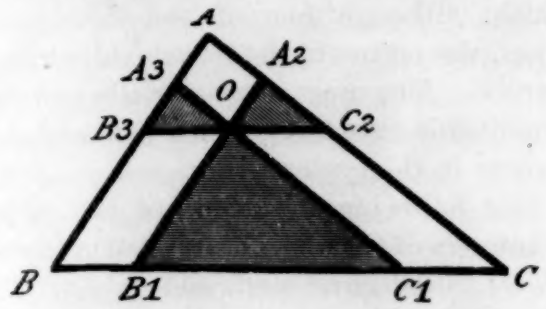
ARTHUR CAYLEY.

How Professor Cayley touched everything mathematical, and touched nothing which he did not adorn, may be illustrated by the following unpublished letters, which were the first expression of discoveries that have since taken their permanent place in our best text-books. They are both the outcome of the sudden and fruitful interest in *linkage*, dating from Sylvester's interview with Tchébychev, when, leaving behind him the diagram of the now celebrated Peaucellier's Cell, the illustrious Russian gave in parting the characteristic advice: "Take to kinematics; it will repay you; it is more fecund than geometry; it adds a fourth dimension to space."

I will transcribe the letters exactly, not

only because the recent death of Tchébychev, followed in less than two months by that of Cayley, gives them now a special pertinence, but because it is of interest to compare one with what is given on 'tram motion' in Kempe's 'How to Draw a Straight Line,' and the other with its reproduction by no less a master than Clifford on pages 149, 150 of his Dynamic, whence I add figure 2.

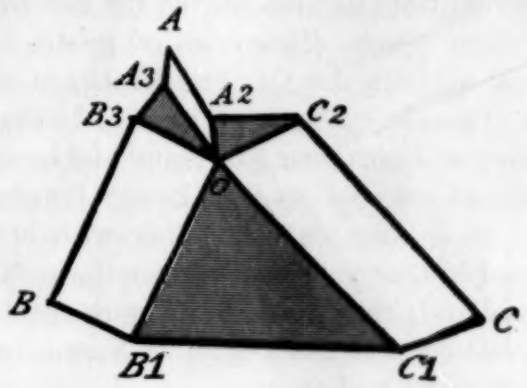
"Robert's theorem of 3-bar motion takes the following elegant form: Take a triangle



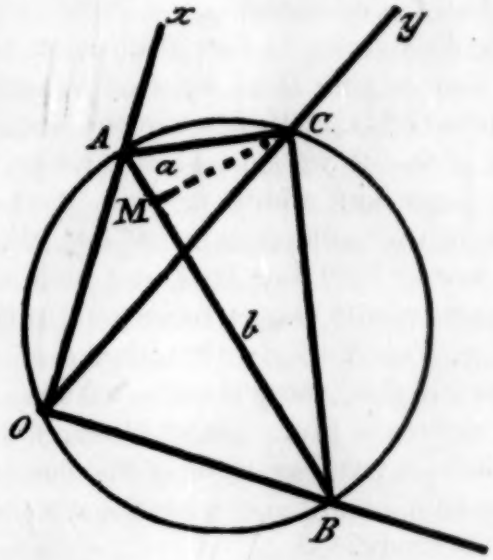
ABC and a point O and through O draw lines parallel to the sides as in the figure, the 3 shaded △'s are of course similar to ABC. Now imagine a linkage composed of the shaded △'s and the bars AA_2, AA_3, BB_3, BB_1, CC_1, CC_2 pivoted together at A, B, C, A_2, A_3, B_3, B_1, C_2, C_1, O; then, however, the figure is moved [of course A_3, B_3 do not continue in the line AB, etc.], the triangle ABC *will remain similar to the shaded triangles;* and if in any position of the figure we fix the points A, B, C, then the point O will be movable in a curve, viz.: we have the *same* curve described by O considered as the vertex of $OA_3\ B_3$, where the two radii are AA_3, BB_3—by O considered as the vertex of $OA_2\ C_2$, etc.—and by O considered as the vertex of $OB_1\ C_1$, etc."

CAMBRIDGE, Feb. 22, 1876.

"The porism is *very* pretty; it was new to me, though I think it ought not to have been so. Look at the theorem thus: Imagine a plane, two points thereof, A, C moving in fixed lines Ox, Oy. Describe the circle OAC, which consider as a circle fixed in the plane and movable with it. Then the theorem is that any point B of this circle moves in a line OB through O. In particular B may be the opposite extremity of the diameter through A, and we have



then the points A,B moving on the lines Ox and OB at right angles to each other, viz.: the general case of a plane moving two points thereof on two fixed lines is reduced to this well-known particular case. And the theorem comes to this, that dividing



the rod AB at pleasure into two parts AM, MB, and drawing MC at right angles, and a mean proportional, the locus of C is a right line through O, which is of course easily proved." Yours very sincerely,

A. CAYLEY.

CAMBRIDGE, May 5.

GEORGE BRUCE HALSTED.

AUSTIN, TEXAS, Feb. 15, 1895.

THE PROTOLENUS FAUNA.*

The above article will be one of especial interest to students of the early Paleozoic faunas, since it describes one of the oldest known.

From time to time during the last thirty or forty years discoveries of fossils have been made in the Cambrian rocks of eastern Canada. Those of the St. Lawrence valley and northern Newfoundland were by Billings referred to the 'Lower Potsdam,' but at a later date, together with others found in that valley and in southern Newfoundland, they have been more specially correlated with the Olenellus Fauna by C. D. Walcott and others.

Other fossils found in the lower part of the Cambrian rocks in New Brunswick below the Paradoxides bed were naturally at first thought to be also of this fauna, but, as will be seen by considerations advanced further on, it does not now seem possible so to establish the relationship.

The discoveries in New Brunswick have from time to time been reported in articles published by G. F. Matthew in the Transactions of the Royal Society of Canada, but such important additions were disclosed through the collections made by W. D. Matthew in 1892 and 1893, and by him in conjunction with G. van Ingen for Columbia College, New York, in 1894, that a special article on this, the Protolenus fauna, has been written. From this article the following abstract has been made of the character of the fauna, and the conclusions arrived at from its study.

The fauna consists of Foraminifera, Sponges, Molluscs and Crustaceans. All the Foraminifera described are referred to the genera *Orbulina* and *Globigerina;* the sponges include *Protospongia* and others. The molluscs are mostly hyalithoid shells of the genera *Orthotheca*, *Hyolithus* and *Diplotheca*. A remarkable mollusc having a helicoid shell and supposed to be a Heteropod, enables me to establish a new genus. The Crustaceans are chiefly of two groups, Ostracoda and Trilobita, of which the former are remarkable for the large number of genera and species, as compared with the trilobites; two predominant and characteristic genera are *Hipponicharion* and *Beyrichona*. All the trilobites are of genera peculiar to this fauna, except *Ellipsocephalus*, which, although one of the dominating types, also occurs in the Paradoxides beds of Europe. The most characteristic genus or trilobites is *Protolenus*, which is abundantly present in the typical beds.

The following are some of the salient characters of the fauna as at present known. *All the trilobites have continuous eyelobes.* This is a decidedly primitive character, and its value in this respect is shown by the genus *Paradoxides* of the overlying fauna, which began with small species having such eyelobes, and culminated in the large forms of the upper Paradoxides beds in which the eye-lobe was considerably shortened. This shortening of the eyelobe was carried still further in the *Oleni* of the Upper Cambrian, dwarfed forms, with a general similarity to the *Paradoxides*, in which the eyelobe is almost on a line with the front of the glabella.

The important family of Ptychoparidæ is absent. This family did not have continuous eyelobes, for in the young, when this projecting fold first shows itself, it is short and at the lateral margin of the head-shield. No trilobite with such an eyelobe has been found in this fauna. The Ptychoparidæ had about a dozen species in the Olenellus Fauna, and became quite common in that with Paradoxides, and continued to abound throughout the Cambrian period.

The genus Conocoryphe is absent. This is specially a type of the Lower Paradoxides

*Abstract of a paper communicated to the New York Academy of Sciences by G. F. Matthew, of St. John, N. B.

beds and under, the name of *Conocoryphe trilineata* (*Atops trilineatus*), is claimed as a characteristic fossil of the Olenellus Zone.

The genus Microdiscus is absent. This trilobite is especially characteristic of the Olenellus Zone and continued to live with Paradoxides. Here it occurs in the Paradoxides Zone, but is absent from the Protolenus Fauna.

The genus Olenellus is absent. Though carefully looked for, no example of this genus has been found among the trilobites of the Protolenus Fauna, hence, though this fauna apparently holds the place where we might naturally expect to find *Olenellus*, that genus proves to be absent, or at least not at all characteristic; and, as so many of its associate genera also are absent, *we cannot regard this fauna* as the *Fauna of Olenellus*.

Of the genera of trilobites that are present *Micmacca* has affinity with *Zacanthoides*. It differs in the course of the posterior exterior of the dorsal suture. The relation will seem closer if we suppose a movement of the eyelobe during the growth of *Zacanthoides* similar to that which occurred in the Ptychoparidæ, by which the eyelobe was drawn in toward the glabella, while at the same time there was a projection of the posterior extension of the dorsal suture outward toward the general angle. If this change were shown to have occurred in *Zacanthoides*, *Micmacca* might be looked upon as an ancestral form of that genus.

In this fauna there is a very primitive assemblage of Brachiopods, of forms which it is in many cases difficult to assign to any known genus. Many are small, some are minute, and the larger species belong to the Obolidæ and Siphonotretidæ.

The Gasteropoda have already been alluded to; among these *Pelagiella* (n. gen.) is remarkable for the peculiar aperture which seems to indicate a free swimming Heteropod.

This fauna is distinguished from that of Olenellus by two marked features; it is more *primitive* and also more *pelagic*.

The way in which the trilobites are bound together by the single feature of a continuous eyelobe shows a unity of origin and a close relationship not found in any other fauna. And yet among these trilobites there are forms which in other respects are parallel to the types which developed in the later faunas; thus in *Protolenus* we have have the flat pleura with the diagonal furrow of *Paradoxides* and the deeply grooved, geniculate pleura of *Ptychoparia*, and at the same time the prominent glabella and deep dorsal furrows of *Solenopleura*. *Micmacca*, as has already been said predicated *Zacanthoides* of a later fauna, and *Protagraulos* in its almost obliterated glabella and flat cephalic shield closely resembles *Agraulos* of the Paradoxides Fauna.

It is a more *pelagic* fauna than that of Olenellus, for we notice the absence of many forms differentiated for shore-conditions. Trilobites with fixed outer cheeks, like *Olenellus* and *Microdiscus* are absent; calcareous corals and sponges are rare; thick-shelled brachiopods and the Orthidæ are wanting, or rare; no Lamellibranch is known, but Foraminifera are quite common in some of the beds.

The question of the antiquity of this fauna as compared with that of Olenellus is discussed. The facies of the fauna as above described indicates a greater antiquity, but if the two faunas were contemporaneous, that of Olenellus may have reached these shores first.

VOLCANIC DUST IN TEXAS.

SOMETIME since the writer was given, for examination by the microscope, a sample of a white, fine-grained silicious deposit by Prof. R. T. Hill, of the U. S. Geological Survey, who writes as follows concerning it:

"The material which I gave you was collected by an old Texas friend of mine, Mr. S. P. Ford, in De-

cember, 1893, who said that at first he supposed it was chalk, but had since come to the conclusion that it is something else. When I wrote to Mr. Ford that I thought it was volcanic glass, probably derived from some of the now extinct vents along the Rocky Mountain front, he expressed some doubt as to this mode of origin, and said :

"'This specimen was from a solid hill from thirty to forty feet high, composed entirely of this stuff. The point I make is that, on account of its thickness, the crater must have been somewhere very close, and if so, is it not something heretofore unknown in Texas? The exact locality is on Duck creek, in Dickens county, about 50 miles northwest of the Double Mountain.' (Dickens county is in northwestern Texas, in the Brazos River drainage.—Author.)

"This specimen undoubtedly comes from the post-Cretaceous formations constituting the great Llano Estacado. Perhaps you will remember that in 1886 I collected some similar material from near Wray, Colorado, and Hecla, Nebraska, which was described by Prof. Merrill of the National Museum, in the American Journal of Science. This Texas material seems very similar to that of the Colorada-Nebraska locality, both in appearance and in geological position. I wish that more was known of the stratigraphy of the Texas beds. The Colorado specimens occur in what is called the White River Tertiary."

An examination by the microscope shows that the white material is volcanic glass, in the angular and fluted forms figured by Merrill,* as characteristic of volcanic dust from Furnas county, in southern Nebraska. Diller † also describes and figures similar forms of glass particles from Norway, Krakatoa, Truckee River and Breakhart Hill, the latter a hill to the north of Boston, Mass. In the same article he describes volcanic dust from Unalashka, which fell in October, 1883, and discusses volcanic dusts in general. Professor Diller concludes that "so far as definite observations have been made, they warrant the general assertion, that with occasional exceptions, which can be readily explained, volanic dust contains a higher percentage of silica than the lava to which it belongs."

Professor Diller has also described some volcanic material from Knox county, Nebraska, and from the West Blue River, Seward county, Nebraska,* and estimated that about 90% was vocanic dust, there being also numerous rolled quartz grains.

The description of the material collected by Professor Hill from Wray (B. & L. R. R.), on the south side of the Republican River, occurs in an interesting article by Professor Merrill, 'On the Composition of Certain Pliocene Sandstones from Montana and Idaho.'†

Three figures are given showing the shape of the particles of volcanic glass found in the sandstones. In the material from the Devil's Pathway (No. 35893 ^{a}) "there are many disc-like bodies on the glass particles, colorless and nearly circular in outline," but the other figures show angular and fluted forms like those above referred to. Merrill gives analyses of three samples of the volcanic dust from Montana and Idaho, and concludes that they are of andesitic or tractytic origin. His analyses include lime and alkali determinations, and the silica contents range from 67.76% to 68.92%.

Merrill also states that some volcanic dust from Krakatoa fell on a ship 885 miles from the source of volcanic activity, so that the existence of a layer of volcanic dust at a given point may not indicate the proximity of the volcano from which the material came, but a deposit forty or more feet thick would hardly form at a great distance from the source.

The volcanic dust obtained by the writer from a layer in the Neocene Lake beds that underlie Mohawk Valley, in Plumas county, California, likewise resembles in the shape of its particles the dusts figured by Diller and Merrill. An analysis of this material by Dr. W. H. Melville showed that it contained 70.64% of silica, and it was there-

* Proc. U. S. Nat. Mus. 1885, p. 100.

† Science, May 30, 1884.

* See article by J. E. Todd, Science, Vol. VII., p. 373.

† Am. Jour. Sci., Vol. XXXII., pp. 199–204.

fore presumed to be a rhyolitic glass.* The material obtained by Professor H : 11 closely resembles the Mohawk Valley material. The Texas occurrence is of unusual interest, being in a region where evidences of the former existence of volcanoes are rare.

H. W. TURNER.

WASHINGTON.

CURRENT NOTES ON ANTHROPOLOGY (VI.).

THE CAUCASIC LINGUISTIC STOCK.

COL. R. VON ERCKERT, of the Russian army, already known for an excellent work on the ethnography of the Caucasus, has just published an epoch-making volume on the languages of that region (Die Sprachen des Kaukasischen Stammes, Vienna, 1895). In this he solves the intricate problem which has so long puzzled linguists as to the relationship and place of these tongues. He demonstrates by satisfactory evidence, structural and lexicographical, that these numerous languages and dialects, some thirty in number (the Ossetic, which is Aryan, being of course excluded), belong to one family, which should be called the 'Caucasic.' It is divided in three groups, the Georgian, the Circassian and the Lesghian. The stock stands wholly independent, all similarities to either Ural-Altaic or Indo-European proving accidental or unimportant. Which of the groups is nearest the ancient original tongue he does not pretend to decide; but he offers striking testimony to the persistence of the traits of these languages. The Georgian was written as early as the ninth century A. D., and he gives a letter composed by a bishop in 918. It is quite identical, both in syntax and words, with the current tongue of to-day.

All these facts are the more to the purpose since so much has been made of late years by Professors Sayce, Hommell and their followers, of what they call the 'Alarodian' linguistic stock (*i. e.*, the Georgian), in connection with the pretended 'Sumerian' of lower Babylonia. It is likely that they will have to 'back water,' now that comparisons can really be made.

* Bull. Phil. Soc. Washington, Vol. XI., p. 389.

CUNEIFORM INSCRIPTIONS.

DR. HUGO WINCKLER, in his 'History of Babylonia and Assyria,' tells us that the cuneiform method of writing was in use among eight nations speaking entirely different languages. Whether this is quite accurate or not, we need not stop to consider, as there can be no question that it had a much wider distribution than used to be supposed. Last year the well-known French archæologist, M. E. Chantre, unearthed specimens of it at Pterium and Cæsarea, in Asia Minor, as far west, perhaps, as such inscriptions have been found in place. The excavations continued by the University of Pennsylvania at Niffer have proved rich in finds of tablets. But the champion recent discoveries appear to be those of M. de Sarzec at Tello. A brief account of his eighth campaign in that rich locality appears in the 'Révue Archaéologique' of December last, extracted from the official report of M. S. Reinach. From it we learn that M. de Sarzec opened a small mound some hundreds of yards from that which he had previously worked, and chanced upon the very archives of the old city themselves. They were inscribed on tablets and neatly stored in trenches, where they had rested undisturbed these thousands of years. From these deposits he took out more than *thirty thousand* tablets, about five thousand in perfect condition, another five thousand very slightly injured, and the others more or less defaced. This magnificent discovery will have the greatest importance in revealing the history and character of the ancient Babylonian civilization.

THE ORIGIN OF NATIVE AMERICAN CULTURE.

Among the Americanists of Europe, Dr. Eduard Seler easily ranks in the first class. He is lecturer on American archæology in the University of Berlin, and his numerous writing are of the most solid merit. Two recent articles by him are significant. One in 'Globus' (Vol. 65, No. 20), entitled 'Where was Aztlan?' was inspired by Mr. Wickersham's aticle in 'Science,' December 8, 1893, in which that writer endeavored to discover 'Asiatic analogies' between the Aztecs, the Puget Sound Indians and various Asian tribes. Seler's second article is broader. It is entitled 'On the Origin of the Ancient Civilization of America,' and appears in the Preussische Jahrbücher (Vol. 79, 1895).

In these able and pointed papers he sums up with masterly force the arguments which prove that the culture of ancient America in all its details was indigenous, starting at various centers independently, and in no item or shred derived from instructors from across the ocean or across Bering Straits. 'American science,' he pertinently says, 'can only win by giving up once for all the vain attempts to construct imaginary connections between the cultures of the old and new continents,' and he points out clearly that this independence of historic connection is what lends to American archæology its greatest importance.

In singular and sad contrast to these truly scientific views are the efforts of a local school of American students to rehabilitate the time-worn hypotheses of Asiatic and Polynesian influences in the native cultures of our continent. The present leader of this misdirected tendency is Professor O. T. Mason, whose articles in the 'International Archives of Ethnography' and in the 'American Anthropologist,' bearing on this question do the utmost credit to his extensive learning and the skill with which he can bring it to bear in a lost cause. His latest, entitled 'Similarities of Culture' (Amer. Anthrop. April, 1895), is so excellent an effort that it is all the more painful to see its true intent is to bolster up a moribund chimera. It is to be hoped that they will not influence the younger workers in the field to waste their energies in pursuing these will-o'-the-wisps of science which will only lead them to bootless quests.

ARCHÆOLOGICAL NEWS FROM SWITZERLAND.

Two or three years ago the curious discovery was made in Switzerland that at one time, during the neolithic period, a dwarf race, true pygmies, flourished in Europe. The bones of a number of them were unearthed at Schweizersbild, near Schaffhausen, in connection with polished stone implements and pottery. The average height of the adults was about 140 centimeters, close to that of the Bushmen. They apparently lived along with other tribes of ordinary stature, as the remains of both were found together. The cubical capacity of the skull was about 1200 c.c. Several anatomists have given the skeletons close attention, notably Professor J. Kollman, of Basel, in the 'Verhandlungen der Anatomischen Gesellschaft,' May, 1894, who appends to hispaper a bibliogrophy of articles relating tothe find.

The abundant richness of Switzerland as an archæological field is strikingly shown by an archæological map of the canton Zurich, prepared by Dr. J. Heierli, and just published in the city of the name. It is very neatly printed in colors, showing by the tint the relative age of the station, whether neolithic, Roman, Allemannian, etc. The author has added a pamphlet of explanations and an index, so as to familiarize students with the local sites and what they signify. It is heartily to be wished that some State of our country would follow this excellent example and thus lead to a more intelligent comprehension and a better preservation of the antiquities on our soil.

SOUTH AMERICAN TRIBES AND LANGUAGES.

IN the February number of the Journal of the Anthropological Institute, Mr. Clements R. Markham, republishes his 'List of Tribes in the valley of the Amazon,' which first appeared about twenty years ago. Of course there are many improvements in the enumeration; but it is amazing to note that by far the best recent authorities are not referred to, and their material is ignored. In the 'list of authorities' there is no mention, for instance, of the names of Von Den Steinen, Ehrenreich or Barbosa Rodriguez. For the linguistics he quotes Dr. Latham as still the authority. In fact, the best work done in Amazonian ethnography within the last decade is not mentioned nor utilized.

Some interesting studies in the languages of the Argentine Republic should not be overlooked. The Allentiac was a language, now extinct, spoken in the vicinity of San Juan de la Frontera. A little catechism, grammar and vocabulary of it was printed by Father Louis de Valdivia in 1607, of which only one perfect copy is known. This has been edited with a useful introduction by José T. Medina (Sevilla, 1894), and has been made the subject of a neat study by General Bartolome Mitré (Estudio Bibliografico linguistico de las Obras de Valdivia, La Plata, 1894; pp. 153). He inclines to consider it a separate stock.

The well-known Argentine linguist, Samuel A. Lafone Quevedo, has added another to the list of his valuable monographs by a thorough study of the mysterious Lule language (Los Lules; Estudio Filologico, Buenos Aires, 1894, pp. 145). It is based, of course, on the grammar of Machoni, and reaches the conclusion that the modern are not the ancient Lules, and Machoni's grammar is that of a tongue which belongs with the Quichuan group, and not among those of the Gran Chaco.

D. G. BRINTON.
UNIVERSITY OF PENNSYLVANIA.

CORRESPONDENCE.

A LARGE REFLECTOR FOR THE LICK OBSERVATORY.

MR. EDWARD CROSSLEY, F. R. A. S., of Halifax, England, has offered to present his 3-foot reflecting telescope to the Lick Observatory with its apparatus and dome, complete. The grateful thanks of the Observatory are returned for this generous and highly appreciated gift.

EDWARD S. HOLDEN.
MOUNT HAMILTON, April 4, 1895.

SCIENTIFIC LITERATURE.

Alternating Generations. A Biological Study of Oak Galls and Gall Flies. By HERMAN ADLER, M. D. Schleswig. Translated and edited by CHARLES R. STRATON. New York, Macmillan & Co.

The recent appearance, from the Clarendon press, of an edition of Dr. Herman Adler's celebrated work, which was published some fourteen years ago, on alternating generations among the Cinipidæ, being a biological study of oak galls and gall-flies, will be welcomed by all interested in the subject, especially by those who do not read German or French. The English translation is by Charles R. Straton. The work consists of: (1) an introduction by the editor; (2) the translation proper, to which the editor has added, in brackets and in smaller type, the popular English name of the gall, the particular oak upon which it is found, and a list of the inquilines and parasites that have been reared from each species; (3) as Appendix I., by the editor, a full account of *Cynips kollari* Hartig; (4) as Appendix II., a synoptical table of oak galls; (5) as Appendix III., a classification of the Cynipidæ, and (6) a bibliography.

The synoptical table of oak-galls (Cynipidæ alone included) is based on European species; while the classification includes not only European but a certain number of

the older American species, but it is very imperfect in taking no note of the many later described American species, especially those described by Ashmead and Gillette. The classification is based on Mayr's, as was that given in Lichtenstein's translation of 1881, and comparatively few additional species are included.

The introduction is very full and includes a discussion of heredity and a rather full summary of late embryologic work, with a view of getting a clearer conception of the philosophy of alternation in generations. Mr. Straton particularly discusses Weismann's views, but by no means accepts them, though a thorough believer himself in natural selection.

Straton points out "that galls may be arranged in groups of greatly increasing complexity and that they must have arisen by gradual and complete improvements in the initial stages of their formation, acting through natural selection over an unlimited period of time and through numerous consecutive species." Each infinitesimal improvement in the gall itself, internally or externally, which has been of service as a protection against parasites or as favoring the development of the larva, has been preserved. In this view of the case, which is one that certainly seems most reasonable, the various characteristics of galls, such as spines, prickles, glutinous secretions, induration, and even size and coloration, are all acquired characteristics for the protection of the larva within. This theory is certainly justified in a large number of cases, but is equally at fault in many others. It would be hard to conceive that the bright colors which many galls assume in an early stage of development or the succulent character and pleasantly sub-acid or fruity flavor of others which renders them so prone to be invaded and preyed upon by a host of other insects could have any relation to the benefits of the gall-maker within. Here, as in most other natural history phenomena, natural selection can hardly be considered an all-sufficient explanation. Likewise, the assumed protective colors which galls often take on in autumn will find more valid explanation in the same causes which produce the similar changes in the leaves themselves, which can have no reference to the welfare of the plant.

No subject connected with galls has perhaps been more written about than the inciting cause of their formation. Adler and Byerinck effectually disproved the older belief that the exciting poison was inserted by the parent in the act of oviposition, *i. e.*, that the initial force was due either to a chemical secretion injected by the gall-mother or to the mechanical stimulus of traumatic irritation. A fluid is secreted in the act of oviposition, but it is absolutely unirritating and acts primarily as a lubricant to facilitate the arduous mechanical act and probably also as a mild antiseptic dressing to the wound made in the plant. Nevertheless there is an irritating salivary secretion produced by the larva itself and the gall growth is co-incident with the hatching and feeding of this larva. The fact that the influence on the plant tissues sometimes begins before the egg-shell is ruptured indicates that this fluid possesses amylolytic and proteolytic ferments. That the influence should be slightly exerted prenatally is not to be wondered at when we consider the delicate nature of the egg covering which often makes it difficult to observe the dividing line between the egg and newly hatched larva.

While, therefore, it is the larva in the Cynipidæ which causes the gall, this is not the case with the many other gall-producing insects, since many of the gall-gnats (Cecidomyidæ) and most, if not all, of the gall-making saw-flies (Tenthredinidæ) secrete a poison in the plant tissue in the act of oviposition, causing the gall to form be-

fore the larva hatches. One must, therefore, in reading Straton's Introduction, bear in mind that he is treating solely of the Cynipidæ. Adler himself recognizes the fact, so far as the *Tenthredinidæ* are concerned, from observations on *Nematus vallisnerii*, which produces a gall on *Salix amigdalina;* but in sweepingly denying it for the gall-gnats (p. 100), on the score that they have no piercing apparatus, he makes one of those generalizations which the facts do not justify, as most of the gall-making species have a very effective and specialized piercing ovipositor. This is, of course, not homologically comparable to that of the Hymenoptera, but is no more exceptional than is the wonderful piercing apparatus of Pronuba among Lepidoptera, being, like this last, a modification of the tubular tip of the abdomen and of the chitinous rods connected therewith.

Adler shows very conclusively that, in spite of the great variation in form, size, appearance and manner of formation, or whether they grow from bud, blossom, leaf, bark or root, galls spring invariably from the zone of formative cells or the cambium ring, just as indeed does the whole life of the plant. These cells are the theatre of actual metabolism. They are not differentiated into stable tissue, but await a period of developmental activity and possess the very conditions essential to gall formation. This explains the fact that Cynipid galls formed from punctures in the leaf almost always begin on the under surface of the leaf, since the cells of the upper surface have become stable and do not respond to any irritation applied to them; while when the eggs are laid in a dormant bud containing rudimentary leaves consisting of unmodified cells, both surfaces may take part in gall formation, the resulting gall, in such case, growing through the leaf substance. Again, when the egg is laid in the cambium ring of the bark, there is a sharp zonal contrast in the resulting gall between the soft and sappy parenchymatous cells and a harder central zone of wood parenchyma corresponding to the bast and to the wood parenchyma, the softer parts of the gall projecting from the bark while its woody base penetrates into the woody tissue.

From the above facts we come to understand why from winter buds, *i. e.*, where eggs are laid during winter in a bud that is dormant, only bud galls are produced, while from buds pierced in spring, when metabolism has begun, we get leaf-galls. Moreover, it has been proved by Adler, and explains the many failures in the efforts to obtain gall growths by confining gall-flies upon the plants, that if the parent fly fails to reach the formative zone of cambium cells the larva on hatching perishes without forming a gall. Another interesting fact which the writer has observed is that where but one bud-gall is usually produced several eggs are nevertheless inserted in the bud by the parent, a prodigality not uncommon in insects under similar circumstances, and which has some profound significances which we cannot discuss in this connection.

On the question as to what determines the ultimate growth of each particular gall so characteristic of its species Adler ventures no theory or explanation; but all the facts would indicate that it depends on the specific quality of the larval secretion, each having its distinct form of morbid poison working in the same pathologic way as the virus of the various eruptive diseases of man. Bacteriology may, in fact, yet come to our aid in this connection, as it has in the study of the pathologic manifestations of higher animals.

The process of oviposition in the Cynipidæ is a very elaborate one and has been much written about. Adler gives a most full and elaborate description of the mechanism of the ovipositor, and particularly of the ventral plates and bundles of muscles by which

the terebra is worked. The structure of the ovipositor is well known and its parts homologize with those of the same organ in all Hymenoptera. It consists of a large bristle or seta, and of two spiculæ which mortise into it by means of two tenons and form the channel down which the egg passes. The seta occupies half the area of a transverse section of the terebra, and the two spiculæ occupy the other half. The seta has a central canal which contains an air vessel, a nerve branch and some sanguineous fluid. While appearing like a single piece, it is in reality double or composed of two parts which, indeed, are separated at the extreme base, but otherwise firmly soldered together. The spiculæ are serrate or notched near the tip, and the seta often ends in a slight hook. The two spiculæ play by means of strong basal muscles, longitudinally up and down on the tenons of the seta.

The eggs of Cynipidæ are characterized by having a stalk or pedicel of varying length according to the species, the egg-body proper, according to Adler, being at the apical or anterior end which first issues from the body, and the posterior end being also somewhat enlarged or spatulate. In repose the ovipositor is concealed within two sheaths, but in oviposition, according to Hartig's views, the spiculæ grasp the egg-stalk and push it to the tip, the fluids in the egg-body being pressed back in the operation, so that they come to be distributed along the stalk or to lie at the opposite or posterior pole of the stalk. The spiculæ then slightly separate at the tip from the seta and extend beyond it so that the apical end of the stalk becomes free. Now by pressure the fluid at the posterior end passes back through the stalk into the opposite or apical end which is plunged in the plant, the basal portion becoming emptied, the swollen apical end thus remaining in the plant when the ovipositor is withdrawn, filling the distal end of the puncture, which is somewhat enlarged. The empty basal sack of the egg and a portion of the stalk are often left exposed, looking not unlike the empty egg of some lace-wing fly (Hemerobiid).

In short, Hartig's view, very generally adopted, was that the extensile and ductile egg was driven through the ovipositor itself while this was in the plant, and that the contents of the egg-body were pressed back into the egg-stalk or pedicel during the operation and collected in the posterior end, and only after the apical end had reached the bottom of the puncture did these contents stream back into it. Adler would refute this view and draws attention to his own figures on Plate 3, where the eggs and ovipositor are illustrated side by side, all taken from photographs and drawn from the same amplification. These show that the ovipositor is, in every case, longer than the egg itself, the enlarged head of the egg corresponding in direction to the tip of the ovipositor. He argues from this fact that one end of the egg cannot be in the plant tissue while the other is in the canal. He further argues that it is not possible that the whole egg can be received into the ovipositor and glide through it in the way in which Hartig supposed. The operation of oviposition according to his observations consists of three distinct stages: (1) The canal in the plant is first bored, after which the fly rests; (2) the egg is then passed from the ovarium to the entrance or base of the ovipositor, *the anterior swollen end or egg-body hanging out*, since it is too large to be passed down the channel. It is then pushed along by means of the egg-stalk behind being grasped between the two spiculæ. (3) Finally, when the egg-body reaches the perforation, the ovipositor is partially withdrawn and the whole egg is then pushed in till the egg-body reaches the bottom of the puncture. Adler rightly expresses wonder

that this complex procedure should be repeated so often with such great accuracy, and proceeds to describe the tactile hairs connected with the ovipositor which permit the fly to carry out the operation. He further states that, while oviposition in the surface of leaves is in its nature easier, the mechanism of oviposition is exactly the same as in buds.

We thus have two diametrically opposed views as to how the Cynipid egg passes down the ovipositor, the oviduct or passage of which is but one-fourth as wide as the egg-body itself, and into the puncture prepared for it. Hartig gave a perfectly simple explanation, and one generally accepted. While it is difficult to understand how the egg can be pushed into the puncture with the swollen egg-body entering first, yet Adler goes into elaborate details and is so careful that one is scarcely justified in questioning his conclusions. There is, however, good reason for doubting their accuracy as applied to all species and for believing that the method described by Hartig does also obtain and that there are even further modifications of the process.

In controverting Hartig and referring to his figures of eggs and ovipositors, Adler gives no indication whether the eggs were taken from the buds after being deposited, or from the ovaries or from the ovipositor, and my own experience with these and other ductile and extensile eggs with long egg-stalks would indicate a very varying length of stalk according to these varying circumstances. Again, he evidently has misjudged Hartig in assuming that the latter describes the passing of the egg down the minute channel of the seta, for Hartig's figures, as well as his description, make it clear that he had in mind the actual facts, viz., the passage of the egg down the channel formed by the connection of the two spiculæ with the seta. He is quite clear on this point and refers to the seta as the egg-guide (Eileiter) and not as the oviduct. He also elaborately describes and figures the eggs in the ovaries, with the swollen egg-body away from and the stalk directed to the base of the ovipositor.

My own studies of the oviposition of *Callirhytis clavula* O. S. in the buds of *Quercus alba* in April show that the eggs are inserted by the egg-stalk into the substance of the leaf, and that the fluids are first gathered in the posterior end which is not inserted. The fluids are then gradually absorbed from this exposed portion into the inserted portion of the egg and by the time the young leaves have formed the exposed shells are empty, the thread-like stalk has disappeared and the egg-contents are all contained within the leaf tissue. The larva now hatches and young galls rapidly form, the colorless and shriveled egg-shell being still often exposed in position and generally some distance from the position of the larva, a difference doubtless representing the original length of the inserted egg-stalk.*

These observations certainly comport more with the conclusions of Hartig than of Adler, though they indicate a quite different

* This agamic gall-fly produces a hemispherical gall involving both sides of the leaf, the cells in the center being connected by loose spongy fiber, and from it comes the sexual species, *Callirhytis futilis* O. S. This in turn produces the twig gall from which the agamic *C. q-clavula* is derived. Mr. H. F. Bassett (*Psyche*, Vol. 5, pp. 235–8, December, 1889) has connected *Callirhytis futilis* O. S. with a new species which he there describes as *Callirhytis radicis*, reared from a gall which is, practically, a blister-like swelling of the root. There is here either an error as to determination or else we have another interesting discovery in connection with these insects, viz., that the same species may indifferently produce a gall on the root or on the twig. When we remember how readily nature in many cases will convert a root into a twig, and *vice versa* this last explanation will not appear so improbable. I may add that Mr. Ashmead, who has reared the fly from the *clavula* gall, has carefully compared it with those actually observed ovipositing in the buds and agrees with me that they are identical.

method of oviposition from that described by either, in that the fluid egg-contents are not passed from one pole to another rapidly in the act of oviposition as described by Hartig, but very gradually, the process not being completed till just before the hatching. I had the assistance of Mr. Th. Pergande in carefully watching the steps in this particular case (in April 1884) and have put them on record here for the first time. Again, a small black wingless species (*Biorhiza nigra* Fitch, subsequently described as *B. politus* by Bassett), is not infrequently found during winter under the shelter of bark scales and oviposits during late winter in the terminal buds of *Quercus alba* and *Q. obtusiloba*. The ovipositor in this case, as in most cases where eggs are laid in dormant buds, is thrust down between the bud-scales until it reaches the soft latent cell tissue toward the center of the bud. And here it is easy to observe, by removing the scaly coverings, as I have done, that the pedicel or stalk only is inserted in the embryo leaf-tissue and that the enlarged portion or egg-body is at first external, being pressed and somewhat flattened by the surrounding leaf-scales.*

In still a third case of a small black inquiline (*Ceroptus politus* Ashm.) oviposition was observed by Mr. Pergande in the mid-rib of *Quercus rubra*, May 20, 1894 ,and in this case, as my notes show, the egg is thrust down into the puncture made by the terebra in the mid-rib until not a vestige of the egg is visible, the pedicel being very short.

There is, therefore, good reason for believing that oviposition in these insects follows no uniform system, and there is a serious question whether Adler's rejection of Hartig's views are justified. In connection with Adler's views as to oviposition, he concludes from his own studies that the main purpose of the egg-stalk is to supply oxygen to the egg-body in the plant-tissues, but that this is also an erroneous conclusion is, I think, made manifest by some of the facts just stated. That the function of the egg-stalk is, rather, to facilitate the otherwise difficult mechanical operation of the passage of the egg down a narrow and elongate ovipositor in the manner indicated by Hartig is supported by the fact that the puncture is often closed at its mouth as also from what we know of the similar oviposition in other orders of insects. The facts, for instance, connected with the oviposition of *Pronuba yuccasella*, where the egg is thrust deep into the ovarian cavity of the Yucca pistil bear out this view. The egg, in this case, as it passes down the ovarium has not a definite pedicel or stalk, but becomes a mere thread in passing through the ovipositor (the nature of which precludes any external outlet during the passage), and the fluids gradually concentrate in the apical or anterior end as the embryo develops. Moreover, it is passed into the ovarian cavity and has no connection through the pedicel with the exterior wound which is closed long before the larva hatches.*

The great service which Adler rendered in the study of the gall-flies was, however, to establish the fact of alternate generation in so many cases. He thus proved the existence of alternate generation in the following species: (See opposite page.)

The writer established, by breeding, the connection of the agamic *Callirhytis operator* O. S. and *C. operatola* Riley in 1872, the facts and specimens having been communicated to

*This fly produces an undescribed vesicular bud-gall from which issues a small black winged bisexual species (*Dryophanta vesiculoides* M S. mihi). The gall produced by this and from which the apterous agamic generation comes is not yet known, though it will probably be a leaf-gall similar to that of *Acraspis erinaceæ* Walsh.

* *Vide* the Yucca Moth and Yucca Pollination, by Charles V. Riley (from the Third Annual Report of the Missouri Botanical Garden). Issued May 28, 1892.

No.	Parthenogenetic Generation.	Flies Emerge.	Sexual Generation,	Flies Emerge.
1.	Neuroterus lenticularis	April	Spathegaster baccarum	June
2.	" læviusculus	March, April	" albipes	June
3.	" numismantis	April	" vesicatrix	June
4.	" fumipennis	May	" tricolor	July
5.	Aphilotrix radicis	April, May	Andricus noduli	August
6.	" Sieboldi	April, May	" testacipes	August
7.	" corticis	April, May	" gemmatus	July, August
8.	" globuli	April	" inflator	June, July
9.	" collaris	April	" curvator	June
10.	" fecundatrix	April	" pilosus	June
11.	" callidoma	April	" cirratus	June
12.	" Malpighii	April	" nudus	June
13.	" autumnalis	April	" ramuli	July
14.	Dryophanta scutellaris	Jan., Feb.	Spathegaster Taschenbergi	May, June
15.	" longiventris	Nov.	" similis	May, June
16.	" divisa	Oct., Nov.	" verrucosus	May, June
17.	Biorhiza aptera	Dec., Jan.	Teras terminalis	July
18.	" renum	Dec., Jan.	Trigonaspis crustalis	May, June
19.	Neuroterus ostreus*	Nov., March	Spathegaster aprilinus	May, June

H. F. Bassett July 10th of that year, though not published till 1873. The synoptical table by Straton does not add to the list as originally published by Adler. The subsequent discoveries have not been many, it is true,† but their inclusion would have increased its value. The facts incidentally recorded in this review add two other American cases to the list, though the alternate gall in one instance has not yet been discovered. It is not difficult to observe these gall-flies in the act of oviposition and to follow up the investigation until the resulting gall is produced, and there is a wide and most interesting field of inquiry which offers rich results for any American biologist who has the time to take it up seriously. The coupling of the alternate galls with each other is, however, more difficult, by direct observation, and is to be arrived at rather from careful identification of the flies in connection with the galls they have been reared from. Even in an epoch-making work like Adler's, the conclusions respecting some of the most interesting problems connected with the economy of galls and gall-flies may yet be questioned, as indicated in this review, and there is unlimited opportunity for careful and conscientious direct observation in a field where experience shows that analogy and sweeping generalizations are often misleading.

C. V. RILEY.

WASHINGTON.

*Franz Löw (Verh. Zool.-Bot. Gesellsh. in Wien, XXXIV., 1885, p. 324) has given good reasons for believing that there was an error here, and that the agamic form of *Neuroterus áprilinus* Gir. is *Neuroterus Schlechtendali* Mayr. It should also be noted that Spathegaster is synonymous with Neuroterus.

†I now only recall, besides those already mentioned in this notice, *Chilaspis nitida* Ger. as the agamic form of *C. löwii* Wachtl., and *Dryophanta cornifex* Hart., as the agamic form of *Syntomaspis lazulina* Först..

A Manual of Topographic Methods. By Henry Gannett, Chief Topographer U. S. Geological Survey. Washington, Government Printing office. Quarto, xiv+300pp. 18 plates.

Whatever may be thought of the advisability of the publication of scientific manuals or text-books by the government, there is probably little question but that a bureau is justified in issuing volumes or bulletins which are in the nature of instructions to its officers and employees. Some publications of this kind, issued as parts of the reports of scientific bureaus, have been of great value to surveyors and engineers on account of the new facts and methods that they contain. The preface of this work states that it was primarily prepared for the information of employees, and furthermore that it 'describes the stage of development reached at present.' Hence it should presumably be of interest and value to all topographers who are acquainted with the excellent maps issued by the Geological Survey. Of the eighteen plates in the volume twelve give beautiful illustrations of types of topography, and these form its most useful and attractive feature.

The 300 pages of the manual include 130 pages of text, 168 pages of tables and 2 pages of index. Although the form is quarto, the size of the printed page is only $5\frac{1}{4}$ x $7\frac{1}{2}$ inches, and being in large type it includes but little more matter than a common octavo page. Chapter I. devotes 14 pages to historical and general information, chapter II. has 26 pages on astronomical determinations, and chapter V. is an interesting geological essay of 25 pages on the origin of topographic features. Thus only 65 pages remain for the discussion of methods of topography, a space entirely inadequate to do justice to the subject.

On base line measurements with the steel tape the corrections due to inclination, temperature and elevation above sea level are explained, but nothing is said about the sag of the tape, which as well known always makes the recorded distance too long, and the effect of varying intensity of pull is also unnoticed. The subject of primary triangulation is presented more fully than any other topic, the general methods of the Coast and Geodetic Survey being adopted, with somewhat different but excellent instructions for measuring angles. No statement as to the allowable probable errors of angular measurements is made, and the remark that the average length of lines in primary triangulation is 12 or 16 miles, leaves a confused idea as to what class of work is really under discussion.

On topography proper 5 pages are devoted to the plane table, 3 to traverses, $1\frac{1}{2}$ to stadia measurements and 9 to barometers. It is difficult to ascertain from these the details of the methods recommended or used, and it is safe to say that the excellent maps now being issued by the Geological Survey were not made without the application of principles and methods of which this volume gives no adequate explanation. It abounds, however, in useful generalities, such as "Stations for sketching should be selected with the utmost freedom;" "Under certain circumstances it is found advisable to use the stadia method for measuring distances instead of the wheel;" "Constant communication must be had between the chief of party and his assistants," etc.

The main feature of a small-scale topographic map is, of course, the contours. In chapter IV. references to the determination of heights by the barometer and stadia are made, but no forms of field notes are given, and the fact that these heights are to be used for locating contours is scarcely mentioned. In chapter V., however, one page is devoted to the subject, the essence of which is that contours are sketched in the field by the chief of party. It is stated that this 'is artistic work,' that "it is impossible

that any map can be an accurate, faithful picture of the country it represents," that the topographer must be able to generalize through his knowledge of geological processes of origin, and that he should be able to decide, " where details are omitted, what to put in their places in order to bring out the dominant features." These are dangerous doctrines. The earth exists, the duty of the topographer is to map it truly, and the study of the origin of its features should come later. It is not a function of the surveyor to interpret nature, and the geologic discussions of Chapter V. seem out of their proper place in a manual of topography.

The book does good service in dwelling upon the important idea that a topographic survey must necessarily be based upon a triangulation, so that an effective control of accuracy may be everywhere at hand. This is set forth with clearness as a sound established principle.

It is difficult to understand why one government bureau should republish tables issued by other bureaus unless they be out of print or not easily accessible. Pages 163–174 and 190–224 give the well-known geodetic and astronomical tables issued by the Coast and Geodetic Survey, and others are taken from the publications of the Corps of Engineers. Of the 168 pages of tables only 24 appear to have been prepared by the Geological Survey. Table XI., for the reduction of stadia readings, gives merely differences of altitude, the reduction to the horizontal being only mentioned in the four lines of text on page 93, where it is said 'tables for this reduction are to be found in Bulletin.' We know, however, of no author of this name who has published stadia tables.

Still more difficult is it to understand why a government bureau should republish a set of logarithmic tables prepared by a foreign author, thus committing a moral if not a legal piracy. Pages 232–298 constitute a reprint of the well-known five-place tables of F. G. Gauss, which are for sale in all bookstores. If the slightest improvement in type or method of arrangement had been introduced some excuse might be seen for this procedure, but as a matter of fact the type employed is far inferior to the original, while the black rules between the columns will prove an injury to the eyes of all who make use of the tables. Moreover, the marks indicating whether the last decimal figures have been increased or not are in all cases omitted; the reprint is thus rendered a most unsatisfactory counterfeit of the excellent original.

This Manual of Topographic Methods is offered for sale by the Geological Survey at one dollar per copy. It is an advantage for many persons to be able to buy a government publication, instead of attempting to beg it through a member of Congress, but in this case it is to be regretted that the value of the contents is so much less than the price demanded. As a presentation of actual field methods, as a manual for the instruction of the employees of the Geological Survey, and as a contribution to science, this volume occupies a low plane compared to what should be expected from a bureau that has done and is doing topographic work of high excellence.

MANSFIELD MERRIMAN.

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Degeneration. By MAX NORDAU. New York, D. Appleton & Co. 1895. 8vo. Pp. 560 + xiii. Price, $3.50.

This is an English translation from the second edition of the original German, the first edition of which was published in 1893, and a French translation of which appeared in 1894.

The author is a pupil of Lombroso, to whom he dedicates his work, and he states that its object is to apply the methods em-

ployed by the modern Italian school in the study of weak, imperfect, degenerate men as found among the criminal and mentally disordered classes, to the identification of degenerates among modern authors and artists. Such degenerates, he declares, manifest the same mental characteristics, and, for the most part, the same somatic features, as do criminals, prostitutes and lunatics.

The physical characteristics, or 'stigmata,' as they are called, of degeneracy in man consist of various malformations which have been described and classified by Morel, Lombroso and others, and which are relied upon to some extent in the diagnosis of doubtful cases of insanity, especially in criminals.

The mental stigmata of degeneracy are also, in many respects, well known, and consist in mental asymmetry, more or less lack of the sense of morality, excessive emotionalism, or its converse, *i. e.*, abnormal apathy and sluggishness, morbid despondency, incapacity for continued attention, and lack of will power, tendency to rambling revery, mysticism, intense egotism, abnormal sexual instincts, etc.

Nordau distinguishes between the hysterical and the degenerate, applying the former term to the admirers and followers of the latter. In his sense there are quite as many hysterical males as females. He is not a physician, and his ideas of hysteria do not precisely correspond with those of the ordinary practitioner; he is a literary critic who has made a special study of morbid mental phenomena and attempts to apply this knowledge to the elucidation of the characteristics of certain forms of modern art and literature with which he is remarkably familiar. He takes up in succession the impressionists, the mystics, the Pre-Raphaelists, the symbolists and the decadents and æsthetes, discussing Ruskin, Holman, Hunt, Rossetti, Swinburne, Morris, Verlaine, Mallarmé, Tolstoi, Wagner, Péladan, Maeterlinck, Baudelaire, Oscar Wilde, Ibsen, Zola, Nietzsche and many others. The only illustration of degeneracy in a scientific man which he gives is Zöllner. His criticisms of these are by no means scientifically impartial; they are at times almost vituperative, but they are in the main just, and substantiated by his quotations, and his strong expressions of condemnation and disgust will in the majority of cases meet with sympathy on the part of an intelligent reader, even if he does find some of the adjectives too sweeping and unqualified.

The chief defect of his work considered from the scientific point of view is its want of logical order; it may almost be said to be composed of two different works, composed in two different moods, one of which was strongly pessimistic, the other more calm and impartial; the first an eloquent appeal to the emotions, the second addressed rather to the reason, and these two parts are so arranged and mixed that it is necessary to read the book from cover to cover and to rearrange and classify the matter in one's own mind, before one can be reasonably sure that he knows the views of the author, and this is the more necessary because the book has no index. For example, the first chapter entitled 'The Dusk of the Nations,' is an eloquent piece of pessimism, yet Nordau is by no means a pessimist; in fact, he considers pessimism as one of the stigmata of degeneration, and the reader after finishing the first chapter should next read the last two chapters, which relate to the prognosis and treatment of the disorder under discussion, in which chapters the author points out that the symptoms which he has described pertain mainly to the scum or froth and to the dregs of population, that the great mass of the people are sound, that the degenerates cannot maintain themselves in the struggle for existence, and that humanity as a whole is

not yet senile. A degenerate organism can transmit to its offspring the morbid peculiarities, but, as a rule, the stock soon dies out.

In like manner, mysticism is treated with considerable detail as a pathological phenomenon, without a hint that it is ever anything else, and it is only in a succeeding chapter that we are told that "Mysticism is the habitual condition of the human race, and in no way an eccentric disposition of mind," and that the difference between what may be termed normal and pathological mysticism is that "the healthy man is in a condition to obtain sharply defined presentations from his own immediate perceptions, and to comprehend their real connection. The mystic, on the contrary, mixes his ambiguous, cloudy, half-formed liminal representations with his immediate perceptions, which are thereby disturbed and obscured."

In his fourth chapter the author discusses the causes of the disorder, summing them up as alcohol and tobacco, the growth of cities, and excessive fatigue due to the great increase in the number of sense impressions, perceptions and motor impulses which are experienced in a given unit of time. His argument from the supposed increase of insanity has no sound basis, for there is no good evidence that it has increased, and on this point the recent report of the General Board of Commissioners in Lunacy for Scotland is very satisfactory. The argument that the present generation is aging much more rapidly than the preceding one because there are more deaths from heart disease, apoplexy, etc., now than formerly is also fallacious. Deaths from all the causes which chiefly affect persons over fifty years of age are becoming more frequent, because the proportion of persons over fifty years of age is becoming larger, and the death rates of children are becoming smaller.

His therapeutics are not very definite, being mainly the promotion of education, the condemnation of works trading on unchastity, and the branding of the pornographist with infamy. This is rather the treatment of a symptom than of the disease itself.

The real problem of dealing with the degenerate, and of checking their increase, is no doubt mainly connected with the conditions of city life and the increasing use of mechanism, and is to be solved by changes in municipal organization adapted to the new conditions of the day, combined with intelligent direction of the work of private associations of various kinds.

The work of Nordau should be carefully read by every one who is interested in social progress; the translation is excellent, and it is a book well calculated to make one think. His dogmatic statements as to the mechanism of nerve cells in mental phenomena are, for the most part, pure hypotheses based on materialism and taking no account of the persistence of individual consciousness, but they are in many ways suggestive and interesting; and while one must object to some of his premises, his conclusions with regard to the majority of the authors whom he discusses will probably be accepted by the majority of persons who are competent to form a definite opinion on the subject.

J. S. BILLINGS.

Darwinism and Race Progress. By JOHN BERRY HAYCRAFT, M. D., D. Sc., F. R. S. E., Professor of Physiology, University College, Cardiff. London, Swan, Sonneschein & Co. New York, Charles Scribner's Sons. 1895.

This is an eminently sensible book, and besides its scientific interest it deserves the study of social reformers and religious teachers. Dr. Haycraft holds that the muscles and brains of a race are not bound to decay, but that the human species in

civilized countries is in fact deteriorating because we are breeding from inferior types. The increased knowledge of recent years is being applied to free mankind from those hardships and diseases which have beset them. But although we may improve an individual during his lifetime, both in physical capacity and mental and moral power, this improvement is not transmitted in any appreciable degree to the offspring, who have therefore to begin again where the parents began. Men can leave their full purses to their sons, but no legacies of mental and moral improvement, or not much. Therefore the action of healthy surroundings will never produce a robust race out of a feeble race, nor will the action of the best educational system ever devised develop a race of wise men out of a race of fools.

This leads our author to a dicsussion of the question whether acquired characters are inherited, or whether the reproductive cells remain unaffected by local changes in the body cells, and he sides with Darwin and Weismann rather than with Lamarck and Herbert Spencer. Racial change is brought about by selection, *i. e.*, by the death or nonproductiveness of certain sorts of individuals, so that the others alone remain; and if this remnant is organically superior, then the next generation will be so. But at present we are not perpetuating our best. The gardener perfects his stock by selecting seed only from the best; and improved breeds of cattle are produced in the same way—not by any new method of ventilating the cowshed, nor by any freshly discovered patent fodder—yet we foolishly fancy we can regenerate society by better food and improved dwellings. We must resort to selection rather. Preventive medicine is saving us from small-pox, measles, typhoid fever, etc.; but these diseases previously exercised a selective influence to carry off the feeblest, who are now preserved to become race-producers. Leprosy also exterminates the unhealthy, and must be looked upon as a friend to humanity. The germs of phthisis or scrofula are our racial friends. Sufferers from phthisis are prone to other diseases as well, and are unsuited for the battle of life, yet because of a certain attractiveness of personal appearance they easily marry, and they leave a large progeny. It follows that by exterminating the bacillus of consumption and giving this delicate and fragile type of persons an advantage in the struggle of life we may imperil the well-being of the future of the race. Even drink may be looked upon as a selective agency, constantly thinning the ranks of those who are weak enough by nature to give way to it, and leaving unharmed those with healthy tastes and sound moral constitutions. Besides the diseased and the drunken there are the incorrigibly criminal, the class whose feet take by nature the crooked path, and who at present are allowed to transmit the taint and the tendency.

What is the remedy? The argument might seem to give a moral sanction to the broadcast scattering of the germs of disease, and to the leaving of unlimited whisky on the doorsteps of our weaker neighbors. But no! other ways are open to us. As regards drink, indeed, Dr. Haycraft would not impose any other restraining influence than a man's own conscience and sense of self-respect. But as regards persons tainted with disease, he does not suggest any such merciless measure as a lethal chamber for them or their offspring. He is content that preventive medicine should continue its work, so beneficent to the individual; but he thinks we ought to replace one selective agency by another. There is already a widespread feeling against the marriage of persons with a distinct family history of insanity. He would try to strengthen that feeling and extend it to other forms of weakness and

disease. In the course of time public opinion might sanction legislation of a prohibitive character. As to inveterate criminals, we must bring our minds to the remedy of the perpetual confinement of the irreclaimable, so that they may die out and leave no successors.

After discussing the competition of brain against brain and the fact that property is not always acquired by the most capable, and considering the effect of modern democratic attemps to equalize the struggle, as also the question of the relative sterility of the capables and the possible swamping of the capables by the incapables, our author says he cannot doubt that by selection England, in a hundred years, might have its average man and woman as well endowed in body and mind as are the best of us today.

It should be mentioned that Dr. Haycraft has a high regard for the deserving poor and wishes to see the criminal and vagrant class separated from them in our poor-houses and treated differently.

GEO. ST. CLAIR.

CARDIFF, WALES.

A Short History of Chemistry. By F. P. VENABLE, PH. D. 12 mo. Pp. viii., 163. Boston, D. C. Heath & Co. 1894. Price, $1.00.

What may be called the historical habit of mind is of great value to the student of any science. Many things are constantly met with which can only be understood in the light of their historical setting. This is especially true in the case of a science which has seen so many vicissitudes and so many changes in its point of view as has chemistry. For this reason a book which gives a clear, concise outline of the historical development of the science is sure to find an extensive field of usefulness.

The present author follows, in general, the division into periods as given by Kopp, but discusses the periods of Medical Chemistry and of Phlogiston together under the head of 'Qualitative Chemistry' and adds a period to which the name of Structural Chemistry is given. The opinion is expressed that this period has already passed and that we are entering upon a new and different phase of development for the science. His characterization of the present tendencies of the science is, however, necessarily vague and unsatisfactory.

The book is well written and there appear to be few errors. On page 141 the value of 15.96 for the atomic weight of oxygen is based, incorrectly, on the authority of Stas, instead of on that of Dumas and of Erdmann and Marchand.

For any student who desires more than a very elementary knowledge of the science, the book must, of course, be considered as an outline which is to be filled out by extensive reading of larger works. But, whether used by itself or in connection with other books or lectures, it is hoped that a book which is so easily accessible to every one will give a new impetus to a phase of chemical study which has been too much neglected.

W. A. NOYES.

ROSE POLYTECHNIC INSTITUTE.

A Laboratory Manual containing directions for a course of experiments in Organic Chemistry systematically arranged to accompany Remsen's Organic Chemistry by W. R. ORNDORFF. Boston, Heath & Co. 1894.

As indicated by the title, this manual contains directions for the experiments in Remsen's Organic Chemistry in a form suitable for students in the laboratory. The page being printed on but one side, ample room is left for the student's observations and, as the text-book is not open before him, he is led to observe for himself, instead of merely trying to see what the text-book says he should. As stated by Professor Remsen in the preface, "Great care has been taken to

determine the best condition for each experiment, and in many cases the directions given are undoubtedly better than those given in my (R's) book." Frequently, however, the only difference in the directions is that in the text-book they are more or less general, whereas in the manual they are given in great detail and, though the student may thus fail less frequently the first time he tries to make a substance, the educational value is diminished. Often more is learned by failure than success. The student must determine the necessary conditions himself. Thus he becomes self-reliant and learns to think chemically. This fault of the manual is to some extent compensated by the questions asked on almost every page. On the whole, the book will be found a valuable aid, especially in those laboratories in which the instructor can not devote much time to each student.

Felix Lengfeld.

University of Chicago.

NOTES AND NEWS.

INVESTIGATION OF THE GOLD AND COAL RESOURCES OF ALASKA.

Congress at its last session ordered a special investigation of the gold and coal resources of Alaska, appropriating $5,000 therefor. The investigation will be made under the direction of the U. S. Geological Survey, and will be under the immediate charge of Dr. George F. Becker, the well known gold expert. With Dr. Becker will be Dr. Wm. H. Dall, paleontologist, who has a superior knowledge of the geography and the general geology of the region. These experts and a single geologic assistant will comprise the party.

The party will leave Washington City, May 15, and it is proposed, with the sum available, to spend three months in actual field work, spending a month in each of three distinct districts along the Alaskan coast. Work will be begun in the Sitka area, where both gold and coal are known to occur. Transportation into and about the various inlets and bays to the north and west of Sitka will be furnished, through the courtesy of Secretary Herbert of the Navy, by the U. S. S. Pinta, which will be stationed in those waters. From the Sitka region the party will go to Kadiak Island and Cook's Inlet by mail steamer. In this region both gold and coal will be looked for also. The district to be visited last is Shumagin, to be reached by mail steamer from Kadiak. In the last named region, as in the other areas, gold and coal will be the main objects of inquiry, though the district is otherwise of very considerable geologic interest on account of its fossil remains and the presence of an active volcano.

The search for coal is one of especial interest to the Navy Department; if coal suitable for use as fuel in the war vessels and revenue cutters in the Pacific were found to be available in quantities, it would be of incalculable advantage to the Government.

It will not be feasible with the limited fund available to carry this investigation of gold and coal resources as far as might be desired. There is demand, for example, for an investigation of the gold placers of the Yucon river, but to do this work effectively the geologist will have to remain in the Yucon region through one summer and through the ensuing winter.

A REDFIELD MEMORIAL.

The botanical section of the Academy of Natural Sciences, of Philadelphia, which had under consideration the subject of a monument commemorative of the services to botanical science of the late John H. Redfield, Conservator of the herbarium of the Academy, has issued a circular, saying:

"It has been decided that no better monument to the memory of John H. Red-

field could be erected than to arrange for completing and caring for the work he loved, and to which he gave freely so many years of his life—namely, the Herbarium of the Academy of Natural Sciences. Mainly through his disinterested labors, it stands to-day scarcely second to any in the United States, containing, besides many unnamed, over 35,000 named species of flowering plants and ferns, the half of which have been verified and fastened down.

"No one can probably be found to give the years of time he so freely gave. In order to carry on the work, and add to the collection, as exploring expeditions afford the opportunity, it has been proposed to establish a Redfield Memorial Herbarium Fund.

"Mr. Redfield's will provides that his herbarium, minerals, shells and scientific works shall be sold to help the herbarium, thus furnishing a nucleus for the proposed fund. It is in mind to raise $20,000, but the interest of any sum that may be contributed can at once be made available.

"Statements will be furnished from time to time to contributors, keeping them informed of the progress of the contributions. Checks may be made payable to the order of Thomas Meehan, Director, or Stewardson Brown, Treasurer, and mailed to either at the Academy of Natural Sciences, Nineteenth and Race streets, Philadelphia."

THE MOTION OF CLOUDS.

AT a meeting of the *Royal Meteorological Society*, of London, on March 20th, Mr. W. N. Shaw, F. R. S., delivered a lecture on 'The Motion of Clouds considered with reference to their mode of formation,' which was illustrated by experiments. The question proposed for consideration was how far the apparent motion of a cloud was a satisfactory indication of the motion of the air in which the cloud is formed. The mountain cloud cap was cited as an instance of a stationary cloud formed in air moving sometimes with great rapidity; ground fog, thunder clouds and cumulus clouds were also referred to in this connection. The two causes of formation of cloud were next considered, viz.: (1) the mixing of masses of air at different temperatures, and (2) the dynamical cooling of air by the reduction of its pressure without supplying heat from the outside. The two methods of formation were illustrated by experiments.

A sketch of the supposed motion of air near the centre of a cyclone showed the probability of the clouds formed by the mixing of air being carried along with the air after they formed, while when cloud is being formed by expansion circumstances connected with the formation of drops of water on the nuclei to be found in the air, and the maintenance of the particles in a state of suspension, make it probable that the apparent motion of such a cloud is a bad indication of the motion of the air. After describing some special cases, Mr. Shaw referred to the meteorological effects of the thermal disturbance which must be introduced by the condensation of water vapor, and he attributed the atmospheric disturbances accompanying tropical rains to this cause. The difference in the character of nuclei for the deposit of water drops was also pointed out and illustrated by the exhibition of colored halos formed under special conditions when the drops were sufficiently uniform in size.

THE DISCRIMINATION OF COLORS.

PROFESSOR ARTHUR KÖNIG (*Zeitschrift für Psychologie*, Feb., 1895) has calculated, from experiments previously published, the number of hues or colors that can be distinguished in the spectrum. Differences in hue cannot be perceived beyond $\lambda = 655\ \mu\mu$ and beyond $\lambda = 430\ \mu\mu$; between these limits the normal eye can distinguish about

160 hues. According to König, the dichromatic eye (green or red blind) can distinguish nearly the same number of hues, its accuracy being greater than that of the normal eye in certain regions. The seven colors inherited from Newton should be abandoned. Physically, any three wavelengths, sufficiently separated, suffice to produce all the colors; psychologically, we can distinguish about 160 hues, or, as Leonardo da Vinci stated, there are four distinct colors—red, yellow, green and blue. In the same paper König calculates that about 660 degrees of intensity or brightness can be distinguished between the light that is just visible and the light so intense as to be blinding.

THE KARAKORAM HIMALAYAS.

In a lecture before the Imperial Institute of London, Mr. William Conway described the expedition to the Karakoram Himalayas made in 1892 under the auspices of the Royal Geographical Society, the Royal Society, the British Associotion, and the Government of India. The party consisted of the Hon. C. G. Bruce, Mr. A. D. M'Cormack, the lecturer, and two others, with an Alpine guide. The lecturer stated, according to the report in the London *Times*, that starting from Abbottabad, they went to Srinagar, the capital of Kashmir, thence by the Burzil pass to Astor and Bungi, in the Indus valley. The party followed the road to Gilgit, and a month was then spent in exploring the glaciers at the head of the Bagrot valley, and the great peaks in the neighborhood of Rakipushi. Returning to Gilgit they ascended the Hunza-Nagar valley, and visited the towns. From that point two long expeditions were made into the snowy region to the south and southeast before pushing forward to Hispar, which was at the foot of the longest glacier in the world outside the polar region. Dividing themselves into two parties, they made the first known passage of Europeans up the Nushik pass, and the first definitely recorded passage of the Hispar pass. The two parties united at Askole, in Baltistan, and, proceeding up the Braldo valley, arrived at the foot of the remarkable Baltoro glacier. Having forced their way to the very head of the glacier, they camped for two nights at an altitude of 20,000 ft. The Pioneer peak, which was 3,000 ft. above the camp, was also climbed, thus making, it was said, the highest ascent yet authentically recorded. Returning to Askole, they crossed the Skoro pass to Shigar and Skardo, whence they rode up the Indus valley to Leh, the capital of Ladak, or Western Tibet. The Zoji pass to Kashmir was traversed, and the party returned from Srinagar to England.

GENERAL.

Professor James D. Dana died at New Haven, on April 14th, at the age of eighty-two years.

The sixty-fifth meeting of the British Association for the Advancement of Science will commence on Wednesday, the 11th of September, under the presidency of Sir Douglas Galton, well known for his works upon sanitation, and as an adviser of the Government in matters of sanitary engineering. An invitation is issued to the philosophers of England and other countries, by the Secretary, to support this meeting by personal assistance and written contributions. Americans who have been the guests of the British Association know how admirable the arrangements are for the conduct of these meetings and how, by invitation to the General Committee and the Sectional Committees, a visitor from a foreign country is soon made to feel that he is a part of this great scientific organism.

At the last meeting of the Victoria Institute, of London, Sir George Stokes, Bart, F. R. S., in the Chair, papers by Sir J. W.

Dawson, C. M. G., F. R. S., Professors E. Hull, F. R. S., Parker and Duns, the Rev. G. Whidborne, and Mr. J. Slater, F. C. S., were read upon the questions in regard to natural selection and evolution, treated by Professor Huxley in his recent address on 'The Past and Present.'

ON May 4th the Association for the Education of Women is to hold a general meeting in the Schools, Oxford, to consider the question of a petition to the University for the admission of women to the B. A. degree.

DR. SHERRINGTON, now Superintendent of the Brown Institution, London, has been appointed to the George Holt chair of Physiology at Liverpool, vacant by the removal of Professor Gotch to Oxford.

DR. H. WEBER, Professor of Mathematics in the University of Göttingen, has accepted a call to the University of Strassbourg, and Professor Hilbert, of Königsberg, has been called to the vacant chair in Göttingen.

DR. E. R. L. GOULD has accepted a call to the Professorship of Statistics in the University of Chicago.

MR. THEODORE T. GROOM, of St. John's College, Cambridge, has been appointed Professor of Natural History in the Royal Agricultural College, Cirencester, succeeding the late Professor Harker.

DR. JOHANNES BRUMMER, Professor of Agriculture in the University of Jena, died recently at the age of forty-three years.

THE death is announced of the Irish Naturalist, Mr. A. G. More.

THE Appalachian Mountain Club, of Boston, announces the following excursions for 1895: April 19, Long Walk; May 11, May Walk—Nobscot Hill and Wayside Inn; May 30, Mt. Tom and Mt. Holyoke; July 1–8, Field Meeting—Seal Harbor, Mt. Desert; August, A probable excursion to the Selkirk mountains in British Columbia, occupying an entire month.

A PSYCHOLOGICAL INDEX, being a bibliography of the literature of Psychology and cognate subjects for 1894, has been published by Macmillan & Co., as a supplement to the *Psychological Review*. The index has been compiled by Mr. Howard C. Warren, of Princeton College, and Dr. Livingston Farrand, of Columbia College. 1312 titles are given, distributed as follows: General 135, Genetic, Comparative and Individual Psychology 259, Anatomy and Physiology of the Nervous System 190, Sensation 107, Consciousness, Attention and Inhibition 176, Feeling 50, Movement and Volition 116, Abnormal 278.

SOCIETIES AND ACADEMIES.

THE MINNESOTA ACADEMY OF NATURAL SCIENCES, MINNEAPOLIS. JOINT MEETING WITH THE ST. PAUL ACADEMY OF SCIENCE.

March 6th, in the rooms of the St. Paul Commercial Club.

The Physical Features of the Lake of the Woods: PROFESSOR CONWAY MACMILLAN, State Botanist.

Psychic Effects of the Weather: EDWARD S. BEALS, Observer U. S. Weather Bureau, Minneapolis.

Geology and Flora of the Mountain Region of Northwestern Montana: D. R. MCGINNIS, Secretary St. Paul Commercial Club.

April 2d in the Public Library, Minneapolis.

Fatigue; its Cause and Social, Religious, Economic and Educational Aspects: H. S. BAKER, PH. D., Principal of the Jefferson School. St. Paul.

Some Queer Forms of Shellfish: PROFESSOR H. L. OSBORN, Hamline University, St. Paul.

C. W. HALL, *Secretary.*

NEW YORK BRANCH OF THE AMERICAN FOLK-LORE SOCIETY.

ON the evening of Saturday, April the 6th, the annual meeting of the New York Branch

of the American Folk-Lore Society was held with the following result:

The officers elected for the season of 1895–96 are as follows: President, Mr. E. Francis Hyde; First Vice-President, Mr. George B. Grinnell; Secretary and Treasurer, Mr. William Burnet Tuthill; as members of the Executive Council, Mrs. Henry Draper, Mrs. Mary J. Field and Mrs. E. Francis Hyde. The offices of Second Vice-President and the fourth lady member of the Executive Council were not filled, the places being held vacant for the action of the Executive Council.

It was determined to hold the final meeting of the season on the evening of Tuesday, May the 7th, at the Hotel Waldorf. The speaker for the evening will be Dr. Matthews, of Washington, the subject being Navahoe Myths, illustrated by phonograph. It is also the intention of the Council to have four meetings during the coming season; three of them to be held at the Hotel Waldorf and one at the Museum of Natural History. At the meetings held at the Hotel Waldorf the members of the Society will be entertained after the reading of the paper.

Wm. B. Tuthill, *Secretary.*

THE NEW YORK MINERALOGICAL CLUB.

At the last meeting of the New York Mineralogical Club the following officers were elected for the ensuing year: President, George F. Kunz; Secretary, Professor Daniel S. Martin; Treasurer, J. W. Freckleton; Executive Committee, E. Schernikow, Dr. E. S. Arnold and Professor A. H. Chester; Curators, Professor R. P. Whitfield, Gilman S. Stanton and William Niven; Committee on Admissions, J. McCarthy and Frederick Kato; Committee on Executions, J. S. Walker, Professor D. S. Martin and Frederick Kato; Delegates to Scientific Alliance, George F. Kunz, Professor D. S. Martin and J. W. Schoonmaker.

SCIENTIFIC JOURNALS.

THE ASTROPHYSICAL JOURNAL, APRIL.

Recent Researches on the Spectra of the Planets, II.: H. C. Vogel.

A summary of recent work on Jupiter, Saturn and Uranus. Photographic observations reveal no deviation in their spectra from that of the sun, but in the less refrangible region bands due to the absorption in the atmospheres of the planets have been recorded visually. A comparison of the visual spectrum of Uranus as mapped by Keeler and by Vogel shows little variation. Repeated observations on the red spot of Jupiter indicate no difference between its spectrum and that of the belts. From a study of the red region, the satellites probably have atmospheres similar to that of the primary. The spectra of Saturn and the ansæ of the ring on each side are identical in the more refrangible portion. That there is no absorption band at λ 618 $\mu\mu$ indicates the absence of an atmosphere around the rings.

On the Periodic Changes of the Variable Star Z Herculis: N. C. Dunér.

After discussing various observations upon this variable and giving its ephemeris, the writer concludes that Z Herculis is a connecting link between the algol and the γ Cygni types, differing from algol in having both components bright, and from γ Cygni in that the components are of unequal brightness. It consists of two stars of equal size, one of which is twice as bright as the other. The stars revolve in 3 days, 23 hours, 48 minutes, 30 seconds, in an elliptical orbit whose semi-major axis is six times the diameter of the stars. The plane of the orbit passes through the sun.

Preliminary Table of Solar Spectrum Wave-Length, IV.: H. A. Rowland.

The table is continued from λ 4266 to 4414.

T. Andromedæ: E. C. Pickering.

A study of later photographs indicate that

the period of this variable, which was 281 days during 1891–1894, has changed for 1896.

Eclipse of Jupiter's Fourth Satellite, February 19, 1895: E. C. PICKERING.

A photometric observation before and after eclipse, compared with the second satellite.

Spectrum of Mars: LEWIS E. JEWELL.

A spectroscopic study of the water vapor of the earth's atmosphere shows that, unless the amount of water in the atmosphere of Mars is greater than that in the earth's atmosphere, it is useless to look for it there, with our present instruments. The chances for detecting oxygen and chlorophyl are better.

On a New Method of Mapping the Solar Corona: GEORGE E. HALE.

A method for using the differential bolometer. Evidence is offered that the heat radiation of the corona could be differentiated from that of the adjacent sky. If one member of the bolometer be exposed to a portion of the sky just beyond the coronal region, and the other member set successively on different parts of the coronal image, the galvanometer would indicate the varying radiation of heat intensity. Methods are also proposed for reducing the galvanometer readings to a form suitable for comparison with actual photographs of the corona.

On a New Form of Spectroscope: C. PULFRICH.

A translation from the *Zeitschrift für Instrumentenkunde*, describing a modification of the Littron spectroscope.

Minor Contributions and Notes.

Photographic Correcting Lens for Visual Telescopes: JAMES E. KEELER.

The Color of Sirius in Ancient Times: W. T. LYNN.

On the Variability of Es.-Birm. 281: T. E. ESPIN.

The Displacement of Spectral Lines Caused by the Rotation of a Planet: JAMES E. KEELER.

Dr. Pulfrich's Modification of the Littrow Spectroscope.

A list of the titles of recent publications on astrophysical and allied subjects appearing since the last number is a feature of each issue.

THE PHYSICAL REVIEW, MARCH–APRIL, 1895.

THE leading article in this number of the *Review* is one by Dr. A. S. Mackenzie, *On the attractions of Crystalline and Isotropic Masses at Small Distances* The primary object of the paper is to give in detail the methods and results of an investigation made for the purpose of determining whether, within the errors of observation, there is any deviation from the law of Newton in the case of attracting crystalline matter with reference to its optic axis, and the author gives also the results of some experiments made with a view to testing the application of the same law in the case of isotropic matter at small distances.

Physicists do not yet fully appreciate the value of the ingenious device suggested by Professor Boys through which they have lately been able to use quartz fibres, which furnish a mode of suspending small masses far ahead of anything before made use of in stability or constancy of torsional resistance. Like many other apparently minor discoveries or inventions, the introduction of the quartz fiber has greatly enlarged the opportunities of the experimentalist, in that it provides a ready means of measuring forces so minute as to have been thought until recently quite beyond our reach. The solution of problems relating to near attractions has especially been forwarded by this device, as Professor Boys has himself shown in several able and important investigations. In the paper under consideration Dr. Mackenzie describes the apparatus used in studying the attraction of crystalline

masses. It is simple but effective, and so delicate in its indications that the utmost care was necessary to avoid interference for external causes, often difficult to control. Full details are given, as they are of great interest, especially to those who contemplate the use of a quartz torsion fibre. It is interesting to note that the author was never able, throughout a long series of experiments, to control absolutely the zero point of his balance. Although quartz is enormously superior to any other suspension thus far proposed, it is still defective in this respect. For some cause which Dr. Mackenzie is unable to give, the zero was constantly shifting. He does not clearly say whether this partakes of the nature of a 'drift' in one direction or not. In a long series of experiments, made by direction of the writer of this notice, for the purpose of trying to improve the existing form of the vertical force magnetometer, quartz fibres were used. Although apparently well protected from convection currents and changes in temperature, the mirror attached to them *was never actually at rest.* When this shifting and drifting is small, as it usually is, and observations are of the nature of those described by Dr. Mackenzie, that is, not in themselves extending over long periods, the error arising from it may be readily and correctly eliminated.

The apparatus used for observing the attraction of isotropic masses was of the same character, and similar to that used by Professer Boys. The conclusion reached, the experimental results being in agreement within one or two-tenths of one per cent., is that neither in the case of crystalline nor isotropic masses was any deviation from the law of Newton detected. The author fails to note the very ingenious and interesting method of attacking the problem of the attraction of crystalline masses proposed by Poynting in his Adams Prize Essay on the Density of the Earth. Poynting proposes to test the question of there being different properties as to attraction along different axes of crystals by the *directive action* which must exist when one sphere of a crystal is in the field of another. He made some experiments along that line, and his work probably preceded by a year or two that of Dr. Mackenzie. At the present moment, with library out of reach, I am unable to say whether he has published any further results.

The *Influence of Temperature on the Transparency of Solutions*, by E. S. Nichols and Mary C. Spencer, is another prominent article of the Review. Transparency to various wave-lengths was tested and a number of color solutions were examined. There are also papers on the Electric Conductivity of Certain Salt Solutions, by A. C. MacGregory, a continuation of the paper on Forces between Fine Solid Particles totally Immersed in Liquids and among the minor contributions is one interesting and useful on the Variation of Internal Resistance of a Voltaic Cell with Current, by Professor Carhart. T. C. M.

NEW BOOKS.

Die Chemie des Chlorophylls. L. Marchlewski. Hamburg und Leipzig, Leopold Voss. 1895. Pp. iv + 82. M. 2.

Les Aurores polaires. Alfred Angot. Paris, Felix Alcan. 1895. Pp. vii + 315.

Lehrbuch der Allgemeinen Psychologie. Johannes Rehmke. Hamburg und Leipzig, Leopold Voss. 1894. Pp. 582. M. 10.

Iowa Geological Survey, Vol. III. Des Moines, Published for the Iowa Geological Survey. 1895. Pp. 501.

Magnetismus und Hypnotismus. G. W. Gessman. Vienna, A. Hartleben. 2d edition. Pp. xiv + 205.

Bulletin of the Geological Institution of the University of Upsala. Edited by Hj. Sjögren. Upsala, Almqvist & Wiksells. 1893–1894. Pp. 95, 293.